

REMARKS

Status of the Application

Applicant affirms his election, without traverse, to prosecute the invention of Group I, claims 1-46. Accordingly, claims 47-59 are withdrawn from further consideration. Should the Examiner find that pending claims are in condition for allowance, the Applicant would cancel the restricted claims. Claims 60-64 were added by Applicant in the Response to Notice of Non-Compliant Amendment. Claims 60-62 depend from claims 1 or 2. Claim 63 is an independent claim and claim 64 depends from claim 63. Claims 60-64, as added in the Response to Notice of Non-Compliant Amendment, are all drawn to the invention of Group I. Applicant respectfully requests that the Examiner consider these claims, in addition to reconsidering the rejections of claims 1-46.

New claims 65-74 have been added. Support for the new claims is found on page 12, lines 9-10 (claim 65); page 7, lines 13-15 (claims 66, 68-69); page 10, lines 29-31 (claims 67, 70-71); page 19, lines 31-33 (claim 72); page 20, line 1 (claim 73); and page 26, lines 16-19 (claim 74). Applicant has added these claims to address the Examiner's remarks in paragraph 10, pages 6-7 of the Office Action. The particulars of how these claims address said remarks will be developed in detail in the Remarks that follow.

Claims 1, 3, 5, and 64 have been amended. These claims have been amended either to address informalities previously overlooked or to add clarity.

Claims 1-3, 5-8, 10-12, 16-21, 24-33, and 36-46 stand rejected under 35 U.S.C. §102. Claims 1-59 stand rejected under 35 U.S.C. §103. Applicant respectfully suggests that the latter rejection applies to claims 1-46 since claims 47-59 were withdrawn pursuant to Applicant's election without traverse. The election was made on June 15/16, 2005, before the date of the instant Action.

Applicant restates and incorporates by reference herein all remarks presented in Applicant's response to the Non-Final Office Action mailed on 10/26/2004 and Response to Notice of Non-Compliant Amendment.

The Action to which this paper responds was made final by the Examiner.

Claim Rejection Under 35 U.S.C. §102(b)

Claims 1-3, 5-8, 10-12, 16-21, 24-33, and 36-46 have been rejected under 35 U.S.C. §102(b) as being anticipated by Prentice, et al., U.S. Patent No. 5,171,768 (hereinafter "Prentice"). To anticipate an invention, the prior art reference must disclose *each and every* limitation of the claimed invention. The instant application claims a process for producing a

polymer (as defined on page 4, lines 8-13 of the specification) comprising (i) conveying mixtures of one or more monomers and one or more initiators to one or more hybrid reactors maintained at effective polymerization temperatures and sub-reflux gage pressures and causing polymerization of a portion of the monomers into a polymer, and (ii) conveying the hybrid reactor contents to one or more batch reactors maintained at effective polymerization temperatures and reflux gage pressures and polymerizing a remaining portion of the hybrid reactor monomers into the polymer. "Polymer" is defined in the specification at the place cited above as a homopolymer, various copolymers, a non-aqueous polymer dispersion, star polymer, microgel, or oligomer. Applicant's process requires at least one hybrid reactor monomer and at least one hybrid reactor initiator. In certain embodiments a polymerization medium is present; the medium is a liquid phase in which polymerization of monomers initiated by initiators takes place. The medium may be composed of one or more, or combinations of one or more, organic solvents, an aqueous medium, and a polymeric component. The optional aqueous medium can be water or a combination of water and water miscible solvents. The monomer mixture may or may not be miscible in the medium; miscibility or lack thereof will determine whether homogeneous or heterogeneous polymerization takes place if there is more than one variety of monomer. The process in its simplest embodiment is a two-stage process: in the first stage, monomers are partially polymerized under sub-reflux gage pressures in the hybrid reactors and in the second stage, polymerization of the unreacted monomers from stage 1 is completed in the batch reactors under reflux gage pressures. The second stage can be repeated, in as many steps as needed, to complete polymerization. In both stages, polymerization occurs at high temperatures.

Prentice discloses a free radical emulsion polymerization process for producing a latex composition. The process comprises (i) initially polymerizing non-carboxylic comonomers in the presence of carboxylic monomers to yield 3% to 12% polymer product, and then (ii) copolymerizing a conjugated diene with the unreacted non-carboxylic comonomer from step (i) in the partially polymerized latex from step (i). The Prentice process requires at least one conjugated diene, at least one non-carboxylic comonomer, at least one unsaturated carboxylic monomer, water, chain transfer agents, non-polymerizable substituents such as electrolytes or chelating agents, emulsifiers, and initiators. Prentice, Col. 1, line 35 to Col. 2, line 4. Prentice is also, essentially, a two stage process, though the two stages do not read on the Applicant's two stages. In the first stage, non-carboxylic comonomers are polymerized in the presence of unsaturated carboxylic acid monomers to a conversion of 3% to 12% to form a

partially polymerized latex. In the second stage, the conjugated diene primary monomer is copolymerized with the unreacted non-carboxylic comonomer from the first stage in the presence of the partially polymerized latex from the first stage. See Prentice *loc. cit.* Prentice's process may include multiple second stages in multiple separate reaction zones. That is in fact preferred. In the application, polymerization is partial, or substantially complete, in stage one; the subsequent stage(s) is where the polymerization begun in the first stage is completed.

There are several essential limitations, or elements, of the claimed invention not disclosed or taught by Prentice. Prentice does not disclose homopolymerization, or a polymerization process that does not require chain transfer agents. (In the Applicant's invention, only the process for producing a graft copolymer, claims 33-45 use an optional chain transfer agent, claims 34-35. Only claims 34-35 include the transfer agent.) Prentice does not disclose a first stage of polymerization, or co-polymerization, under sub-reflux gage pressures to obtain a low molecular weight polymer without the use of chain transfer agents. Sub-reflux polymerization in stage 1 is an essential element of Applicant's invention, and this limitation is present in all pending claims. Moreover, Prentice teaches that temperature parameters are critical reactor conditions, while the instant invention claims manipulations of sub-reflux or reflux gage pressures in conjunction with temperature as critical to maintaining suitable reaction conditions for achieving product having the desired structure and physical properties. Prentice teaches that the conversion to polymer in stage 1 is 3% to 12% with 5% to 10% preferred, while the invention claims first stage polymerization of 30% to 99% (see, *e.g.*, claims 12, 32).

The Examiner has also cited specific areas of Prentice which are relied upon as citations that purportedly anticipate the instant invention. As asserted above, a finding of anticipation under 35 U.S.C. 102(b), based upon a patent or printed publication, requires that the reference disclose all limitations of the claimed invention. This statute, as it pertains to a patent or printed publication, is a loss of right provision. In short, if the inventor or a third party (as is the case here) patents or publishes *the subject invention* in this or a foreign country more than one year prior to the effective U.S. filing date of the patent application under review, the right to receive a patent for that particular *invention* is forfeited. Note that the statute sets forth that "A person shall be entitled to a patent unless – (b) *the invention* was patented or described in a printed publication" [emphasis added]. This necessarily requires a comparison of the elements of the claims of the invention against the cited reference. For any

claim under review to be anticipated under §102(b) by a prior patent or publication, each element of each claim under review must be identically shown in a single reference. These elements must also be arranged as in the claim under review. *In re Bond*, 15 USPQ2d 1566, 1567 (CAFC 1990). As shown below, there are instances in the Office Action where the Examiner has cited purportedly anticipating references in Prentice that do not show all of the elements of the claim under review, often only very few of the elements, if that. Specific instances are discussed immediately below. The Examiner has not, therefore, met the requisite burden of proof for a finding that the invention disclosed in the application has been anticipated by Prentice.

For example, the Examiner cites Prentice, Col. 2, lines 63-65, for the proposition that functional or specialty monomers may be included in the polymerization process to effect certain polymerization and application properties. The excerpt goes on to recite functional groups: hydroxyl, amide, methylolamide, ester, amine, epoxy, aldehyde and halide. Typical specialty functional groups are set forth at Col. 3, lines 1-13. (The specialty functional components in Prentice are non-carboxylic comonomers that are polymerized in the presence of unsaturated carboxylic monomers in the first reaction zone to produce a partially polymerized latex monomer that is copolymerized with a conjugated diene primary monomer in the second and subsequent reaction zones.) The application, page 17, lines 18-23, 27 recites functional acrylic monomers, but the examples cited in Prentice do not read on the Applicant's Markush group (claim 25, supported by the cited portion of the application). (In the application, the functional monomers are polymerized in the first stage reaction to form a partially or substantially polymerized non-latex product; the polymerization is completed in the second stage.) The invention in Prentice, therefore, is the pre-polymerization of the non-functional and acid functional monomers in order to tie up the non-functional monomer. Subsequently, this pre-polymer is polymerized with the conjugated diene. In this way, codimers of conjugated diene and the non-functional monomers are avoided.

Another of Applicant's examples, (meth)acrylonitrile, is not even given as a generic example (*viz.*, nitrile functional group) of a functional or specialty monomer in Prentice (compare the application, page 17, lines 18-23, 27 and claim 25, with Prentice, Col. 2, line 63 to Col. 3, line 20). Col. 3, line 68 does indeed recite an "aqueous phase" but in an entirely different context, teaching that emulsion polymerization, especially of latexes, requires "many different nonpolymerizable components" (Col. 3, lines 63-64) and that water, a necessary component in Prentice and an optional one in the application, can be used as a carrier for

some of these necessary, nonpolymerizable, components, such as chelating agents, electrolytes, emulsifying agents, or surfactants and other ingredients (Col. 3, line 68 to Col. 4, line 3). The aqueous phase in the invention, alone or in combination with water miscible solvents and/or organic solvents and/or a polymeric component, acts as a solvent, in which monomers may or may not be miscible, thus contributing to a determination of whether homogeneous or heterogeneous polymerization will take place. Applicant would earnestly and respectfully submit that the words “the aqueous phase” as used in Prentice does not read on the aqueous medium as used, for example, in claims 3 and 5 of the invention.

While Prentice discloses a CSTR and Applicant specifies that the hybrid reactor is a CSTR (claim 9) and that the batch reactor is a CSTR (claim 20), this limitation is not essential to, and is not recited at all in, claim 1. Prentice discloses temperature and pressure parameters, but does not disclose essential limitations that the first stage polymerization is achieved under sub-reflux conditions and the second stage under reflux conditions. Nor are the temperature ranges in Prentice directly comparable to the claimed ranges of the invention, because the solutions used in each are so different, and gage pressures can vary significantly. In Prentice, polymerization is not completed until after the third zone (preferably about 80% to about 90% achieved), so it can be deduced that up to 99% polymerization in Prentice will not be achieved until fourth zone, or later, polymerization. The claimed preferred embodiment of the instant invention would complete polymerization in a single reaction zone in the second stage of polymerization (claim 65). Prentice discloses that first stage polymerization does not exceed 12%, whereas in the instant invention, first stage polymerization is at least 30% (claim 12, also claim 32).

Finally, Applicant submits that “sub-reflux” and “reflux” conditions are not inherent in Prentice for the reasons stated by the Examiner. Though there is a two-stage process, CSTR tanks can be used both in the invention and in Prentice, and a high rate of monomer conversion can be achieved in both the invention and the reference, the differences in the methods, objects and goals of both inventions are too different for inherency. As noted above, Prentice requires a highly complex mixture of three polymerizable moieties (non-carboxylic comonomer, unsaturated carboxylic acid monomer, and conjugated diene), water, chain transfer agents, electrolytes, chelating agents, emulsifiers, and initiators, as well as solvents, (Col. 1, line 63 to Col. 2, line 4, and, *e.g.*, Example 1). The invention requires at least one monomer and at least one initiator, with at least one solvent component preferred. It would be very difficult, even for one skilled in the art, to compare the reaction conditions of Prentice’s

complex solutions to produce a latex composition and the conditions required to prepare a homopolymer or copolymer of the invention. That carboxylated latex compositions with reduced levels of impurity can be produced under conditions disclosed in Prentice does not inherently lead a skilled polymer engineer to the conclusion that very different polymers being reacted in different solutions, without chain transfer agents, emulsifiers and catalysts, would be produced in high yield and purity under purportedly similar conditions.

Applicant respectfully submits that the foregoing claim amendments and remarks establish that Prentice does not disclose each and every limitation of the claimed invention, and that therefore, the invention is not anticipated by Prentice. The Examiner is respectfully requested to withdraw this rejection.

Claim Rejection Under 35 U.S.C. §103(a)

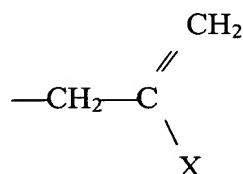
Claims 1-59 are rejected under 35 U.S.C. §103(a) as being unpatentable over Berge, et al., U.S. Patent No. 5,362,368 (hereinafter, "Berge") in view of Prentice. As suggested above, Applicant has respectfully made the assumption that the rejection was intended to apply to claims 1-46, since claims 47-59 were withdrawn from consideration, and will respond accordingly. For a finding of obviousness, the prior art references must teach or suggest all the claim limitations. There must be some objective showing that the inventor would have been motivated to modify the reference in some way, with some reasonable expectation of success for the modification. Where primary and secondary references are relied upon, as here, there must be an objective showing that a reasonably skilled practitioner of the relevant art would have known of the primary and secondary references, and been motivated to combine the references, with some reasonable expectation of success, to achieve the results demonstrated in the specification and as claimed in the application. In addition, secondary considerations, such as the achievement of results that have eluded others, provide objective evidence of nonobviousness. *Stratoflex, Inc. v. Aeroquip Corp.*, 218 USPQ 871 (CAFC 1983); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 231 USPQ 81 (CAFC 1986), *cert. denied*, 480 U.S. 947 (1987). The ultimate determination is made on the entire record.

Berge is directed to a method for producing macromonomers, containing at least one reactive terminal functional group, that are useful as precursors for polymers of varying three-dimensional structures, such as block polymers, branched polymers, non-aqueous dispersion polymers, star polymers, and ladder polymers (Col. 7, lines 62-65). Principal objects of the Berge invention were to provide a method of polymerization to obtain macromonomers with an olefinic polymerizable end group using ω -unsaturated oligomer as a chain transfer agent, to

control molecular weight of the macromonomer so produced, to provide an effective process at lower temperatures, reduced initiator costs, and less color in the product (Col. 2, lines 21-25). The overall object was to provide an efficient method for producing macromonomers that would be useful in producing a variety of polymers having applications that would be apparent to skilled practitioners in the art through production methods not disclosed or claimed in Berge. The primary object of Prentice was to produce carboxylated latex compositions, especially carboxylated butadiene-styrene latexes, with reduced presence of the contaminant 4-phenylcyclohexene (4-PCH) and possessing desirable properties of film stiffness and stress-strain relationship. Prentice deals solely with emulsion polymerization at lower temperatures. Emulsion polymerization is heterogeneous polymerization and is directed to transfer between phases.

Among the principal objects of this invention are: to provide processes for producing polymers at reduced hybrid reactor gage pressures for enhancing the safety of the manufacturing process and to produce relatively low molecular weight products without using chain transfer agents and in the presence of relatively low initiator concentrations. Eliminating chain transfer agents is both economical and greatly reduces the presence of impurities in the product and undesirable by-products. Reducing initiator concentrations is also economical. In general, reduced gage pressures limit the dispersity of polymerization initiators, leading to lower yields of product. The Applicant has discovered processes in which gage pressure in stage 1 can be reduced, with concomitant reduction in initiator concentration, without sacrificing yield, while allowing the chemist or engineer to control molecular weight without having to rely upon a chain transfer agent. (Please note the exception, based on claims 34-35, cited above.)

The Examiner primarily relies upon Berge in asserting that the application is not patentable. While it is generally true that in Berge and in the present application, polymerization can be carried out in a CSTR and in the presence of a polymerization medium, these and other general similarities do not teach or enable the different processes and methods employed for different objects and goals. The chain transfer agents in Berge are actually oligomers characterized by an end group represented by the general formula,



wherein X is as defined (Col. 5, lines 16-24). Preferred examples are shown in Col. 6, lines 1-45. While a metal chelate, such as a cobalt complex, may be used as a catalyst in the production of the oligomeric chain transfer agents of Berge, Col. 10, lines 1-28, the chain transfer agents of Berge neither read on those of the invention nor suggest them. The transfer agents recited in claim 35 of the invention are cobaltates.

While the field of claims 33-45 of the invention (a process for producing a graft copolymer) overlap with part of the field of Berge (a process for preparing a macromonomer that has utility with other components in the production of block polymers, branched polymers, non-aqueous dispersion polymers, star polymers and ladder polymers, see Berge, Col. 7, lines 62-65), there are substantial differences in the goals and objects of the two. Berge requires an oligomeric chain transfer agent to produce a macromonomer having an olefinic terminal functional group, where the macromonomers are further polymerizable into a number of diverse polymers having a wide variety of uses and applications. The invention provides a two stage process for producing a high yield of polymer product. And while it is entirely possible that a skilled practitioner in the field of the invention would be aware of Berge, it is also true that such a practitioner would know that Berge does not teach or suggest how to make a polymeric product from the macromonomers disclosed. In addition, it is highly unlikely that a skilled practitioner in the field of the invention would know of Prentice as a reference, since the fields are entirely different. Prentice relates to very specific processes for producing specific latex composition products through emulsion polymerization techniques that are well known in the synthetic latex art. Even if a practitioner of the art of the invention became aware of Prentice, there would be no motivation to combine Prentice with Berge to achieve the goals and objects of the invention.

For the foregoing reasons, Applicant respectfully asserts that the invention is not unpatentably obvious over Berge in view of Prentice, and respectfully requests that the Examiner withdraw this rejection.

The Examiner's Response to Applicant's Amendment

Applicant restates the foregoing remarks, as well as the remarks that accompanied Applicant's prior Amendment, and respectfully asks the Examiner to consider these. Prentice discloses a relatively low temperature polymerization processes, while Applicant discloses and claims a high temperature process that is mediated, especially in the first stage, by controlling the gage pressure. This is a critical limitation in the instant invention that is

neither disclosed, taught nor suggested by Prentice. It is also objective evidence of nonobviousness since low pressure, and low initiator concentration, in a process for producing a high yield of uniformly low molecular weight polymer is highly desirable, from both safety and economic perspectives.

As stated earlier, the reactant solution components *required* for effective polymerization in Prentice are quite complex, and it would not be apparent or obvious, even to a highly skilled practitioner, how to extrapolate temperature and pressure conditions for the Applicant's process from those of Prentice. It is not at all clear from Prentice, given the complexity of the reaction components and media, whether this first stage occurs at reflux, sub-reflux, or whether that is essential to achieving an effective polymerization process. It appears quite clear, however, that the second stage operates under comparable conditions, unlike the invention (sub-reflux vs. reflux conditions). Given the very narrow range of the field of Prentice, emulsion polymerization for the production of latex, it is questionable whether Prentice is even analogous as prior art against the invention. Applicants submit, for reasons stated throughout this paper, that Prentice is non-analogous art and not properly cited against the instant application. There is no reason a chemist making polyacrylics would combine Berge with Prentice. And, as noted earlier, it is counter-intuitive to achieve a high conversion of monomer to polymer under sub-reflux conditions with relatively low initiator concentration. Nothing of the sort is disclosed, suggested or adumbrated in Prentice.

In paragraph 10 of the Office Action, pages 6-7, the Examiner cited Prentice against claims 1, 3 and 16 of the application, and remarked that any initiator concentration can be used, that there is no rate conversion limitation, and that there is no polydispersity requirement. The reference to Prentice regarding claims 1, 3, 16 (aqueous medium) has been answered above. Claim 12 sets forth a polymerization rate of conversion of monomer(s) into polymer in the first stage (30% to 99%). The new claims have been added to address the Examiner's remaining observations. And while there is not a polydispersity requirement as such, the application teaches the use of temperature and gage pressure parameters to control molecular weight and achieve a higher level of uniformity of molecular weight polymers. A skilled artisan would understand that with greater uniformity of molecular weight of polymer product the lower the polydispersity, and could control the weight average of polymer to achieve desired polydispersity. Accordingly, the M_w limitations in the new claims, coupled with temperature and gage pressure parameters, inherently address the manner in which low polydispersity can be achieved.

For all of the foregoing reasons, Applicants submit that the rejections should be withdrawn.

Summary

Applicant respectfully requests reconsideration of claims previously rejected and consideration of amended and new claims. Applicant believes that the stated grounds for rejection have been overcome, and that in this paper, a complete and responsive submission to the Final Office Action dated June 23, 2005 has been made. Based upon the amendments and remarks presented, Applicant submits that this application is in condition for allowance. A Notice of Allowance is earnestly solicited.

Alternatively, if the Examiner does not so find, Applicant requests that the Examiner issue an advisory opinion on any rejections that are maintained. Further, Applicant requests that the Examiner enter the requested claim amendments and new claims, as these would put the claims in better form for appeal.

Applicant believes that this is a no-fee amendment and, accordingly, no fee payment accompanies this paper. If in fact a fee is due that has not been accounted for herein, please charge such fee to Deposit Account No. 04-1928 (E.I. du Pont de Nemours and Company).

Should the Examiner have any questions about the application or the content of this paper, please call the undersigned at the telephone number provided below.

In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Respectfully submitted,



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Dated: 8/23/05